34th NEUROBIOLOGY DOCTORAL STUDENTS WORKSHOP

Conference Booklet

3rd - 7th June 2025

Munich, Germany

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WELCOME TO NEURODOWO 2025!

Dear participant, we are happy to welcome you to this year's **Neurobiology Doctoral Students Workshop (NeuroDoWo)** at **Ludwig-Maximilians-Universität (LMU)** in **Munich**!

For over 30 years, the NeuroDoWo has been organized by doctoral candidates under the patronage of **the German Neuroscience Society (NWG)**. Each year, the workshop travels to a new city, offering early-career neuroscientists a unique opportunity to share their research, exchange ideas, and build lasting professional connections in a relaxed and supportive environment.

This year in Munich, the NeuroDoWo remains true to its core: a space created **by and for doctoral students**. Through talks, posters, and hands-on workshops, you'll have the chance to share your work, exchange ideas, and engage in meaningful discussions with peers from across the neuroscience spectrum - all in an open and informal setting.

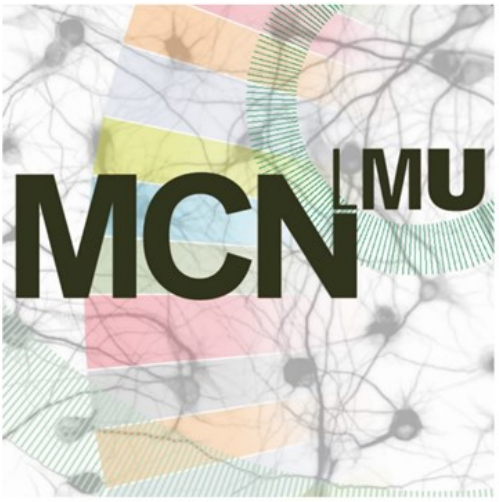
In addition to the scientific sessions, we've prepared a variety of social events and networking opportunities to ensure that your experience goes beyond the lecture hall. Whether you're presenting your work or attending as a listener, we hope you find inspiration, new perspectives, and new friends during your time here.

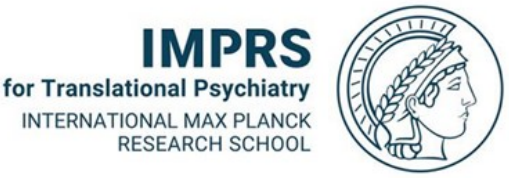
Your presence makes this event possible - thank you for being here! We hope you enjoy the conference and have a wonderful time in Munich!

Your NeuroDoWo Team ♥

Oskar Markkula, Anna Langen, Valentin Winhart, Laurin Teich, Nancy Mulaiese, Evgeniia Bukina, Arash Shahidi, Valerija Kello & Luna Studer

SUPPORTED BY





GENERAL INFORMATION

On-site Registration

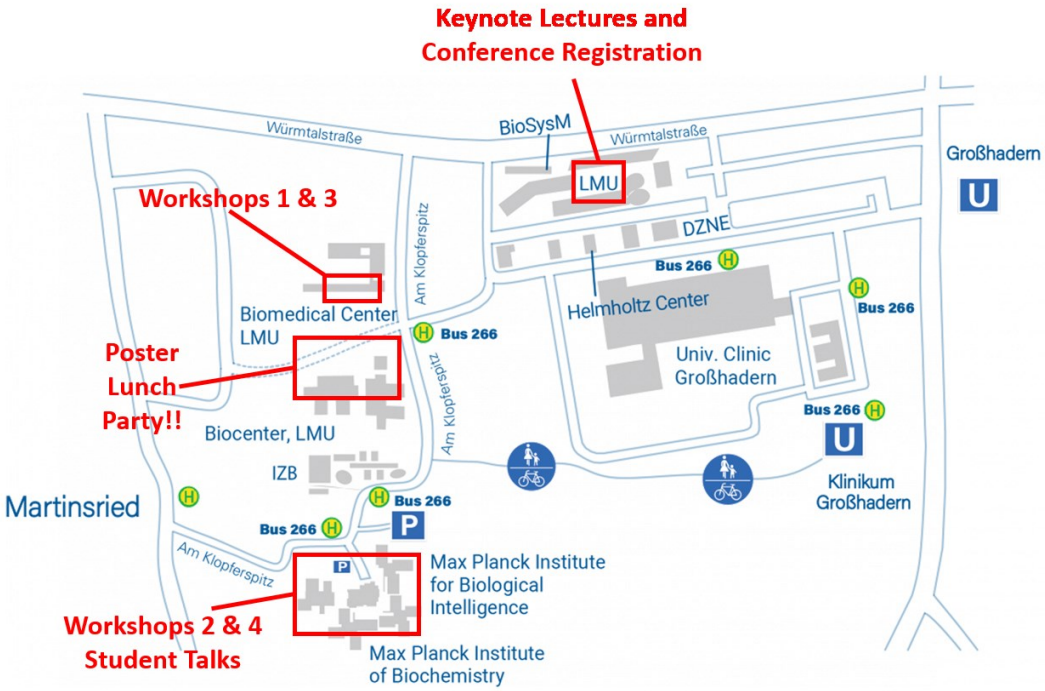
Register at the Pharmacology Department at the inner courtyard (at the white shelter).

Accommodation

- Shared 3-4 bed dorms
- Bring your own towel (or rent at hostel for 2€)
- Breakfast is included (7.00 – 10.30 am)
- Check-out: Friday morning until 10 am

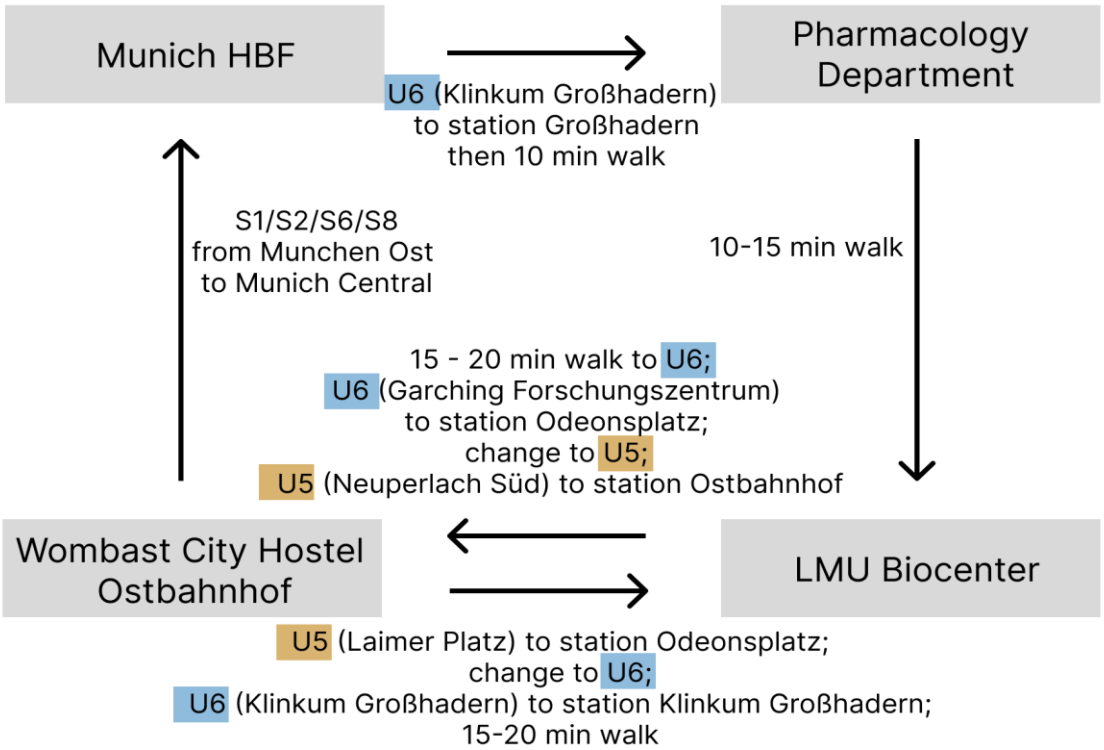
Locations

Keynote Lectures & Conference Registration	***Workshops***	***Hostel***
Pharmacology Department Butenandt Str. 13, 81377 München FU01.011 **Max Planck Institute of Biological Inteligence** Am Klopferspitz 18, 82152 Planegg	**LMU Biomedical Center** Großhaderener Str. 9, 82152 Planegg **Max Planck Institute of Biological Inteligence** Am Klopferspitz 18, 82152 Planegg	**Wombast City Hostel Ostbahnhof** Atelierstraße 20, 81671 Munich



GENERAL INFORMATION

How to get there



To get around Munich by metro, you can purchase tickets at the machines located near U-Bahn stations. Don't forget to validate your paper ticket at the small validation machines before entering the platform.

If you prefer digital options, download the **MVGO app** to buy tickets directly on your phone. The app offers several choices, including single tickets, as well as stripe tickets, and day/week passes - which can be more cost-effective if you plan to travel multiple times a day. All event locations are within the "M" zone. If you already have a **Deutschlandticket**, no additional tickets are required, as it covers all public transport in this area.

The MVGO app also lets you rent **bikes** - just head to the "Explore" section. Alternatively, you can use **e-scooter** services like Lime or Voi, though these may be a bit more expensive.

GENERAL INFORMATION

Updates

To receive any live updates via the conference, you are welcome to enter our WhatsApp group. If you have any problems, you can find all organisation team members as admins in this group. Do not hesitate to reach out, we're happy to help :)

NeuroDoWo 2025 Munich

WhatsApp-Gruppe

Poster and Talk awards

We would like to reward the best posters and the best participant talks with an award. For this, we ask you to fill out the online poll on the last day of the conference. The QR code will be provided at the venue. We will activate the online voting after our last talk session on Friday and you can vote for your favorite poster and favorite talk. There will be two poster prizes as well as two talk awards.

Wifi

You can connect to the Eduroam network throughout all conference buildings.

Lunch breaks

Lunch will be provided at the “LMU Martinsried Mensa” (Großhaderner Str. 6, 82152 Planegg) from Wednesday to Friday. At the beginning of the conference, you will receive vouchers for all the meals there.

Social activities

These events are included in the conference fee and **free of charge**!

We warmly invite you to join our social events - a chance to connect and relax beyond the conference sessions. At the end of the **first day**, we will have an **opening dinner** at a traditional beer garden (Zielstattstraße 6, 81379 München). At the end of the conference, there will be a **closing party** at the **LMU Biocentrum Aula**. We hope you'll join us and have fun!

Explore Munich

Take some time to enjoy Munich beyond the conference. For a night out, check out local favorites like Bahnwährter Thiel (techno), Milchbar (charts), Corleone (indie), Frisches Bier (craft beer), or the iconic Hofbräuhaus for a classic Bavarian experience.

If you’re looking to unwind after a long day of talks and presentations, head to the Isar river (Flaucher) for a walk or a break by the water. Munich also offers great bouldering gyms for those who want to stay active (one right next to the hostel), and the Englischer Garten is perfect for a relaxing stroll or picnic.

There’s plenty to see and do - whether you’re into nature, nightlife, or both.

Conference Schedule

	Tuesday 3.6.	Wednesday 4.6.	Thursday 5.6.	Friday 6.6.	Saturday 7.6.
9:00		*Workshops 1 & 2* **Voice and Language Training** Biomedical Center Großhaderner Str. 9, Planegg-Martinsried N 02.017 (5)	*Workshops 3 & 4* **Data Pipeline Management** Biomedical Center Großhaderner Str. 9, Planegg-Martinsried N 01.017 (5)	**Student Talks 2** MPI-BI Am Klopferspitz 18 Small Lecture Theater (6)	Hostel Check Out (until 10am)
10:00		or	or	**Coffee Break**	
11:00		**Entrepreneurship in Science** MPI-BI Am Klopferspitz 18 Small Lecture Theater (6)	**Grant Writing** MPI-BI Am Klopferspitz 18 Small Lecture Theater (6)	**Student Talks 3** MPI-BI Am Klopferspitz 18 Small Lecture Theater (6)	
12:00	**Conference Registration** Pharmacology/Chemistry inner courtyard Feodor-Lynen-Straße Behind Buchner Hörsaal (1)	**Mensa Lunch** Großhaderner Str. 6, Planegg-Martinsried (7)	**Mensa Lunch** Großhaderner Str. 6, Planegg-Martinsried (7)	**Mensa Lunch** Großhaderner Str. 6, Planegg-Martinsried (7)	
13:00	***Keynote Lecture*** **Prof. Dr. Benedikt Grothe** Pharmacology Theater Butenandtstr. 13F FU 01.011 (2)	***Keynote Lecture*** **Prof. Dr. Magdalena Götz** Pharmacology Theater Butenandtstr. 13F FU 01.011 (2)	***Keynote Lecture*** **Prof. Dr. Wiktor Młynarski** Pharmacology Theater Butenandtstr. 13F FU 01.011 (2)	***Keynote Lecture*** **Prof. Dr. Anna Schroeder** MPI-BI Am Klopferspitz 18 Large Lecture Theater (6)	
14:00	**Opening Words** Pharmacology Theater (2)	**Coffee Break**	**Flash Talks** Pharmacology Theater (2)	**Poster Session 2** Biocenter Aula Großhaderner Str. 2, Planegg-Martinsried (8)	
15:00	**Hostel Registration** *Wombat City Hostel Ostbahnhof* Atelierstraße 20, 81671 München (3)	**Student Talks 1** Pharmacology Theater Butenandtstr. 13F FU 01.011 (2)	**Coffee Break** **Poster Session 1** Biocenter Aula Großhaderner Str. 2, Planegg-Martinsried (8)		
16:00					
17:00					
18:00	**Opening Dinner Beer Garden** Zielstattstraße 6, 81379 München (4) (open end)			**Closing Remarks, Prizes, BBQ** (In front of Biocenter) **Closing Party** Biocenter Aula (8) (open end)	
19:00					

KEYNOTE SPEAKERS

Keynote I - Tue, 03.03.2025, 13:00 - 14:30

Prof. Benedikt Grothe

(Chair LMU Neurobiology)

From neuronal microcircuits to perception: What we can learn from mechanistic and phylogenetic approaches

Keynote II - Wed, 04.03.2025, 13:00 - 14:30

Prof. Magdalena Götz

(Chair LMU Physiology)

Novel mechanisms of neurogenesis and neural repair

Keynote III - Thu, 05.03.2025, 13:00 - 14:30

Prof. Wiktor Młynarski

(Group Leader LMU Computational Neuroscience)

Building a theory of sensory coding for active behavior

Keynote IV - Fri, 06.03.2025, 13:00 - 14:30

Prof. Anna Schroeder

(Group Leader LMU Neurobiology)

Neural circuit mechanisms of internal state driven behavioral flexibility

WORKSHOPS

Workshop 1 - Wed, 04.03.2025, 09:00 - 11:00

Science and Entrepreneurship - Magdalena Reith

Join us for a hands-on workshop exploring the intersection of science and startups! Discover career paths beyond academia, connect with founders and incubators, and learn how to turn research into real-world impact. Gain insights into startup opportunities, expand your network, and take the next step in your professional journey.

Workshop 2 - Wed, 04.03.2025, 09:00 - 11:00

Voice and Language Use - Orlando Schenk

Become a more effective communicator and a better public speaker! An interactive workshop on how to best utilise your voice and language when presenting your ideas to any audience.

Workshop 3 - Thu, 05.03.2025, 09:00 - 11:00

Data Pipeline Design and Management - Dr. Andrey Sobolev

Join us for a practical workshop on building data processing pipelines! In the era of big data, efficient pipelines are essential for success - we'll discuss key skills, best practices, and real-world examples while sharing ideas on how to design and improve workflows.

Workshop 4 - Thu, 05.03.2025, 09:00 - 11:00

Grant Writing - Thomas Baumgarten

How to convince others to fund your science! Improve your writing techniques learning from the experts in the field: DFG! An essential skill for anyone looking to pursue a career in academia.

TALK SESSION OVERVIEW

Talk Session 1 - Wed, 04.06.2025, 15:00 to 18:00		
T1	Gifty Alin Jacob	Neuroecological Insights into Species-Level Differences in Honey Bee Foraging Behaviour
T2	Melanie Stenger	Neural and Muscular Basis of Song and Substrate-Borne Vibrations in Male Drosophila Courtship
T3	Tara Beilner	Eye Movements, Alpha/Beta Power &Memory Retrieval
T4	Monalisa Ghosh	Temporal filtering in motion vision
T5	Patricia Hoffelner	Mimicking Niemann Pick Type C disease in human retinal organoids
T6	Kosisochukwu Umeasalugo	The (injured) brain on (neuro)steroids: diagnostic biomarker utility?
Talk Session 2 - Fri, 06.06.2025, 09:00 to 10:30		
T7	Viktor Beilmann	Overactivation of astrocytes leads to dysregulation of prefrontal neuronal activity and impaired cognition via kynurenic acid
T8	Hanseul Oh	Common Metabolic Defects in Muscular DystrophiesCommon Metabolic Defects in Muscular Dystrophies
T9	Rebecca Bonrath	Human adherent cortical organoids derived from individuals with grey matter heterotopia
Talk Session 3 - Fri, 06.06.2025, 11:00 to 12:00		
T10	Margarita Habib	CASPR2 autoimmunity and neuropathic pain
T11	Julian Nausester	Modulation of GABAAR through plant extracts

FLASH TALK SESSION OVERVIEW

Flash Talk Session - Thu, 05.06.2025, 15:00 to 15:30		
FT1	Chunyan Shi	How does thinking more positively change our mind?
FT2	Gayatri Gandhi	Axonal roles of 7SK RNPs in developing motoneurons
FT3	Shreenidhi Vitchanthangal Prathivathibayankaram	Understanding Canavan disease using 3D myelinoids
FT4	Swathi Radha	Myelin sheath formation in the zebrafish CNS
FT5	Guoming Tony Man	Early cingulate-striatal interactions underlie the development of ultrasonic vocalization
FT6	Rebecca Bonrath	Human adherent cortical organoids derived from individuals with grey matter heterotopia
FT7	Kosisochukwu Umeasalugo	The (injured) brain on (neuro)steroids: diagnostic biomarker utility?

POSTER SESSION OVERVIEW

Poster Session 1 - Thu, 04.05.2025, 15:30 to 18:00		
P1	Chunyan Shi	How does thinking more positively change our mind?
P2	Gayatri Gandhi	Axonal roles of 7SK RNPs in developing motoneurons
P3	Shreenidhi Vitchanthangal Prathivathibayankaram	Understanding Canavan disease using 3D myelinoids
P4	Swathi Radha	Myelin sheath formation in the zebrafish CNS
P5	Guoming Tony Man	Early cingulate-striatal interactions underlie the development of ultrasonic vocalization
P6	Rebecca Bonrath	Human adherent cortical organoids derived from individuals with grey matter heterotopia
P7	Kosisochukwu Umeasalugo	The (injured) brain on (neuro)steroids: diagnostic biomarker utility?
P8	Lea Thüminger	Spinal Motor Networks in Sound-Producing Piranhas
P9	Fabio Laredo	Direct Neuronal Reprogramming of oligodendrocytes progenitor cells
P10	Kanaan Mousaei	Effects of local protein synthesis on protein pool
P11	Carolin Schumacher	Adaptation of eating behaviour by LH populations

POSTER SESSION OVERVIEW

Poster Session 2 - Fri, 06.06.2025, 14:30 to 18:00		
P12	Stefanos Loizou	The role of DNMT3A in neuronal function and its PO
P13	Nekane Balcells Picaza	Function and regulation of Dnmt3a1 in memory formation
P14	Lam Bui	MouseFlow: behavioral tracking in head-fixed mice
P15	Sofiia Ushakova	Modifying physiological TDP-43 oligomerization to reverse neurodegeneration
P16	Krishna Priya Radhakrishnan	Striatal plasticity in stroke survivors using tTIS
P17	Wei Chen	DBS decreases PD pathology in the SN of PD mouse
P18	Lennart Schlaphoff	The role of lipid metabolism in the brain ependymal cell layer
P19	Miguel Bengala	From Predictions to Perception and Back: Predictive Coding during Self-Motion in the Early Auditory System
P20	Yi Peng Toh	Evolution of the olfactory system in Heliconiini
P21	Minnah Irfan	Autophagy modulation to enhance stress resilience
P22	Mansi Yellore Vasanth	Identify effects of CD8+ T cells causing ND in PD
P23	Taisiia Nazarenko	Influence of ApoE isoform on tau seeding

T1. Neuroecological Insights into Species-Level Differences in Honey Bee Foraging Behaviour

Gifty Alin Jacob, Markus Thamm, Hema Somanathan, Ingolf Steffan-Dewenter, Ricarda Scheiner
Department of Behavioral Physiology and Sociobiology, University of Würzburg

Honey bees modulate their foraging strategies in response to physiological and ecological constraints. However, the neurophysiological basis of foraging behaviour remains poorly understood, particularly among co-occurring tropical honey bees. We investigated the foraging dynamics of two native species (Apis cerana and Apis florea) and one introduced species (Apis mellifera) in southern India, across forest, agricultural, and urban landscapes. Gustatory responsiveness has been shown to reliably predict foraging preferences in A. mellifera. We tested whether species and landscape influenced foraging preferences by assessing gustatory responsiveness and honey-crop concentration of returning foragers. We further tested the modulation of gustatory responsiveness by octopamine and dopamine—key neuromodulators of honey bee taste and cognition. Both species and landscape type significantly influenced gustatory responses, whereas crop concentration was affected by species and not landscape. Notably, A. florea (open-nesting) differed from A. cerana and A. mellifera (cavity-nesting) in foraging traits, returning with higher-concentration nectar and exhibiting lower gustatory responsiveness—suggesting species-specific nectar preferences. Octopamine enhanced and dopamine reduced gustatory responsiveness in A. mellifera and A. cerana—but neither affected A. florea. By linking behavioural patterns to brain amine-receptor expression, we intend to evaluate how species-specific neuromodulatory architecture may underlie divergent foraging strategies in co-occurring honey bees.

T2. Neural and Muscular Basis of Song and Substrate-Borne Vibrations in Male Drosophila Courtship

Melanie Stenger
European Neuroscience Institute Göttingen

The brain orchestrates body movement by processing sensory cues and choosing motor programs, ultimately manifesting as muscle activity. Understanding how specific muscles generate distinct behaviors is crucial. Studying Drosophila courtship behavior, we investigate how males switch between air-borne song and substrate-borne vibrations. While song is well understood, the mechanism behind vibrations remains unclear. We hypothesize thoracic muscles produce both courtship song and vibrations. Deactivating wing muscles controlling song reveals overlap with muscles driving vibrations and shape signal characteristics. We apply connectomics and genetics to map networks controlling these muscles, alongside calcium imaging to track muscle engagement during behavior.

T3. Eye Movements, Alpha/Beta Power & Memory Retrieval

Tara Beilner, Xiongbo Wu, Tobias Staudigl
Ludwig-Maximilians-Universität in Munich, Germany

Humans predominantly rely on vision to gather information about the world. Research has consistently identified links between eye movements – such as saccades, fixations, and their sequential patterns – and episodic memory. Successful memory formation has been associated with increased visual exploration and alpha/beta (~8-30Hz) power decreases during viewing of a stimulus. Recent studies have revealed a positive correlation between eye movements and alpha/beta desynchronization in various tasks. Here, we further investigate the links between electrophysiology, eye movements, and memory performance, specifically looking at memory retrieval. Participants engaged in a free-viewing episodic memory task, where they explored naturalistic scenes, followed by a memory retrieval test asking them to distinguish the previously learned from novel scenes. Throughout the task, EEG and eye tracking data were simultaneously recorded. We found that participants made fewer saccades when exploring scenes they remembered compared to when exploring not remembered and new scenes. Time-frequency analyses of the electrophysiological data revealed alpha/beta power decreases associated with increased-exploration and remembered scenes. We are currently analyzing how sequences of eye movements and other gaze patterns established during learning may manifest during retrieval and how these patterns may influence viewing behavior, behavioral performance, and electrophysiology during memory retrieval.

T4. Temporal filtering in motion vision

Monalisa Ghosh, Lukas Groschner, Gottfried Schatz
Research Center, Medical University of Graz, Austria

Visual motion activates retinal photoreceptors in a temporal sequence. To detect the sequence and the direction of motion, the signals of adjacent photoreceptors need to be differentially delayed and compared. My research focuses on how interneurons in the fruit fly's visual system create and register time differences of ten to hundreds of milliseconds to compute the direction of visual motion over a wide range of velocities. I investigate how ion channel composition and distinct circuit motifs allow neurons in the medulla to delay signals relative to their neighbors. The fruit fly as a model organism offers numerical simplicity, well-mapped connectivity, and the ability to manipulate neural activity. I am using patch clamp electrophysiology, electron microscopy, and behavioral experiments to uncover how a small circuit of nine morphologically and transcriptionally similar neurons can produce a filter bank with widely varying time constants.

T5. Mimicking Niemann Pick Type C disease in human retinal organoids

Patricia Hoffelner, Oliver Bludau, Valerio Zenatti, Dominik Paquet, Matthias Prestel, Sabina Tahirovic, Antje Grosche
Biomedical Center Munich LMU, Physiological Genomics

The cholesterol storage disorder Niemann-Pick type C (NPC) disease is caused by a malfunction of either of the two cholesterol transporters NPC1 (95 % of patients) or NPC2 (5 % of patients), leading to hepatomegaly, neurodegeneration, visual impairment and in early onset patients to premature death by age 25 years. We aim to mimic a retinal phenotype in NPC1-mutated (most common patient mutation I1061T) human retinal organoids (hRO) co-cultured with iPSC-derived microglia. The hRO development (D90-150) and the functional state of microglia in D110-D150 hRO was assessed through morphometric analysis using immunolabeling. Maturation of Müller glia, the formation of a photoreceptor layer and synapses and the differentiation of neuronal subpopulations was shown for both cell lines, although some neuronal subpopulations show a better long-term survival in the healthy human donor (HHD) cell line compared to the NPC1 mutant. Further, TSPO (mitochondrial membrane protein; upregulated in gliotic Müller glia and activated microglia) is expressed to a higher extend at later time points in the NPC1 mutant, while the expression decreases in the HHD. This hold true for both, Müller glia and microglia. Further characterization of the hRO is currently conducted and Müller glia functionality is assessed through physiological live assays.

T6. The (injured) brain on (neuro)steroids: diagnostic biomarker utility?

Kosisochukwu E. Umeasalugo, Igor Khalin, Burcu Seker, Philippe Liere, Michael Schumacher, Inga Koerte, Nikolaus Plesnila
LMU Hospital Munich, Institute for Stroke and Dementia Research (ISD)

Mild traumatic brain injury (mTBI) accounts for 80% of all TBI and is difficult to diagnose due to a lack of objective markers. In this study, we investigated whether neurosteroids, synthesized de novo in brain, can serve as blood biomarkers for mTBI. Two cohorts of C57BL/6 mice were subjected to a model of mTBI combining impact with rotational acceleration or sham surgery. The first cohort underwent neurological testing for anxiety, balance, and locomotion before and after mTBI. For the second cohort, brains and plasma were collected 6 or 24 hours after mTBI to measure steroid and neurosteroid levels by gas chromatography-tandem mass spectrometry. Traumatized mice did not suffer from skull fractures, intracranial hemorrhage, or mortality, but exhibited significantly prolonged wake-up time from anesthesia, transiently increased beam-walk time, and mild astrogliosis compared to their control counterparts. Isopregnanolone (ISOPREG) and isoallotetrahydrodeoxycorticosterone (ISODOC), both synthesized by a single enzyme, were significantly decreased by more than 50% in brain parenchyma at 6 and 24 hours after mTBI, while ISODOC was also significantly decreased in plasma (-75%). Therefore, ISODOC may be a candidate diagnostic biomarker for mTBI.

T7. Overactivation of astrocytes leads to dysregulation of prefrontal neuronal activity and impaired cognition via kynurenic acid

V. Beilmann, J. Furrer, SM. Schalbetter, B. Weber, U. Meyer, T. Notter
Institute of Pharmacology & Toxicology, University of Zurich

Astrocyte dysfunctions have long been implicated in psychiatric and cognitive disorders, yet the precise mechanisms underlying this association remain elusive. Here, we show that chemogenetic activation of prefrontal astrocytes in mice impairs short-term memory and sensorimotor gating and attenuates the activation of prefrontal parvalbumin (PV) interneurons. These alterations are accompanied by increases in prefrontal levels of kynurenic acid (KYNA), a neuroactive metabolite, which serves as an endogenous antagonist of NMDA receptors. Pharmacological inhibition of kynurenine aminotransferase II, the key enzyme mediating the transamination of kynurenine to KYNA, reinstates the short-term memory and sensorimotor gating impairments, and normalizes the deficits in prefrontal PV interneuron activation. These findings suggest that astrocyte-derived KYNA impairs cognitive functions by modifying prefrontal E/I balance. To test this hypothesis, in vivo 2-photon calcium imaging experiments in awake mice are being conducted, where the activity of prefrontal neurons and PV interneurons are simultaneously measured following astrocyte overactivation. Taken together, our study identified a mechanistic link between overactivation of prefrontal astrocytes, increased production of KYNA, and cognitive as well as cellular dysfunctions involved in major psychiatric disorders.

T8. Common Metabolic Defects in Muscular DystrophiesCommon Metabolic Defects in Muscular Dystrophies

Hanseul Oh
Friedrich-Baur-Institut

Muscular dystrophies refer to a group of neuromuscular diseases caused by various genetic mutations, all leading to progressive muscle weakness over a lifetime. Although the underlying mutations differ among these diseases, there are certain overlaps in their pathomechanisms, particularly in metabolic defects. At this conference, I will introduce the common metabolic dysfunctions observed in muscle cells derived from patients with these diseases and discuss how these dysfunctions contribute to disease progression. Furthermore, this investigation may pave the way for identifying a shared drug target, providing new therapeutic possibilities across multiple forms of muscular dystrophy.

T9. Human adherent cortical organoids derived from individuals with grey matter heterotopia

Rebecca Bonrath (*LMU*), Silvia Cappello (*LMU*), Femke de Vrij (*EMC*), Cristina Campi (*UNIGE*), Mark van der Kroeg (*EMC*)

Human organoids are a valuable human system to model neurodevelopmental disorders. However, reproducibility issues and longtime cultures are limiting this model system. Therefore, we have established adherent cortical organoids. These organoids are highly reproducible and reduce the cultivation time for electrophysiological readout to 8 weeks. They derive from Neural progenitors, plated in a 384 well plate. Thus, they give the opportunity for high throughput screening. Our final goal is to reproduce the migration and electrophysiological phenotypes observed in classic organoids and patients with grey matter heterotopia to provide a robust, reproducible model to study NDDs.

T10. CASPR2 autoimmunity and neuropathic pain

Margarita Habib, Anna-Lena Wiessler, Patrik Fischer, Kathrin Doppler, Carmen Villmann
Institute for Clinical Neurobiology, University of Wuerzburg, Germany

Contactin-associated protein-like 2 (CASPR2) autoantibodies (aAb) are not only associated with encephalitis and epilepsy but also with neuropathic pain. The precise underlying pathomechanism is incompletely understood. Some patients with CASPR2 aAb experience pain while others do not. Patient sera harbor autoantibodies against CASPR2, which are of different IgG subclasses. Almost all patients show IgG4 aAb, however, most sera carry in addition aAb of other IgG subclasses (IgG1, IgG2, or/and IgG3). Dorsal root ganglia neurons (DRGs) play a crucial role in pain transmission. On their membrane, DRGs express the voltage gated-potassium channel (VGKC) complex. Voltage-gated potassium channels (Kv) regulate neuronal excitability and restore the resting membrane potential. As CASPR2 is part of the VGKC complex, the pathomechanism is hypothesized to originate from an alteration of the function of the associated Kv by binding of the aAb to the associated CASPR2 protein.To unravel the impact of CASPR2 aAb, we analyzed structural and functional changes of the VGKC complex of treated DRGs upon CASPR2 aAb treatment. We discovered that CAPSR2 aAb associated with pain alter the structure of the VGKC and cause hyperexcitability of DRGs. The significance of the IgG4 subclass of the anti-CASPR2 aAb was unraveled by patch-clamp recordings.

T11. Modulation of GABAAR through plant extracts

Julian Nausester, Anna-Lena Wießler, Christian Boehm, Helene Loos, Andrea Buettner, Carmen Villmann
Institute for Clinical Neurobiology, University of Wuerzburg, Germany

γ-Aminobutyric acid type A receptors (GABAAR) are the most abundant inhibitory ligand-gated ion channels in the central nervous system (CNS). Depending on their subunit compositions, GABAARs are responsible for phasic or tonic inhibition processes in the CNS. An imbalance between excitatory and inhibitory signal transduction is linked to neurophysiological and mood disorders. Treatment options targeting GABAAR aim to enhance inhibitory function; however, most drugs lack specificity to distinct GABAAR subunit compositions. Hence, the underlying mechanisms and differences between GABAAR compositions and their specific targeting still need further investigation. Various terpenoids from plant extracts are known to allosterically modulate GABAAR making them an interesting target for novel therapeutics. So far, most studies directly applied these substances at relatively high concentrations. In this project, we focus on the modulatory effects of physiologically relevant dosages of terpenoids. We investigate phasic and tonic GABAAR compositions to evaluate subunit-specific effects after 1h of pre-treatment with various plant extracts. Therefore, we are using transiently transfected HEK293 cells and readouts from primary hippocampal neurons. Following a pre-treatment of the cells at various time points, functional analysis is carried out via electrophysiological measurements. In parallel, alterations in subunit expression levels are monitored using Western blot analysis.

FT1. How does thinking more positively change our mind?

Chunyan Shi, Jonathan Wirsich, Zile Chen, Patrik Vuilleumier
Department of Fundamental Neuroscience, University of Geneva

Reappraisal is an intentional attempt to change emotion through reconstrual or repurposing. In our study, we want to reveal the differences between positive reappraisal (reinterpret the cause, outcome and consequence in a more positive way) and negative attenuation (reinterpret in a less negative way). Seventeen university students with healthy mental states were recruited to perform an emotion regulation task, in which they need to watch or reappraise the emotion that are triggered by the pictures (40 neutral and 120 negative, from the Nencki Affective Picture System) according to the instructions. After each picture, they rated on positive emotion, negative emotion and arousal scales. At the same time, brain oscillations were measured using a 64-channel electroencephalography system and skin conductance level was measured with Biopack system. Results indicated that both positive reappraisal and negative attenuation reduced arousal, negative emotion and increased positive emotion. Negative attenuation is mor

FT2. Axonal roles of 7SK RNPs in developing motoneurons

Gayatri Gandhi, Michael Sendtner and Michael Briese
Institute of Clinical Neurobiology, Würzburg, Germany

In the nucleus, the positive transcription elongation factor b (P-TEFb) complex, composed of Cdk9 and cyclin T1, allows transcription elongation by releasing paused RNA polymerase II. This is a regulatory step in the transcription cycle to maintain temporal control of cellular gene expression. The kinase activity of P-TEFb is controlled by 7SK noncoding RNA, which is protected at its 5' and 3' end by the core components Mepce and Larp7, respectively. We previously identified the hnRNP R as a major 7SK interaction partner in developing motoneurons and observed that these complexes mediate axonal mRNA transport. While the nuclear function of 7SK in gene expression regulation has been investigated in detail, there is limited information about the role of 7SK in axonal mRNA transport and axon growth. We found that 7SK has a dynamic expression pattern throughout the development of the spinal cord from E13 up to the adult stage. We characterized a novel 7SK knockout mouse model and found that loss of 7SK affects the formation of NMJs.To elucidate axonal functions of 7SK, we are culturing motoneurons in microfluidic chambers in order to identify axonal 7SK interactors and mRNAs that are localized and translated in axons in a 7SK-dependent manner.

FT3. Understanding Canavan disease using 3D myelinoids

Shreenidhi Vitchanthangal Prathivathibayankaram, Oliver Brüstle
Institute of Reconstructive Neurobiolgy, Universitätsklinikum Bonn

Canavan disease (CD) is a progressive and fatal leukodystrophy caused by mutation in aspartoacylase (ASPA) which catalyses the deacetylation of N-acetyl-L-aspartate (NAA) into aspartate and acetate. Accumulation of NAA and the resulting lack of acetate are thought to disrupt osmotic balance, energy homeostasis, myelin production, and histone acetylation. Major hallmarks of CD include intramyelin vacuolization and major abnormalities in the glial compartment, including swollen astrocytes with enlarged mitochondria and abnormally structured cristae, but the specific underlying molecular mechanisms remain unknown. In this study, human induced pluripotent stem cell (iPSC) ASPA knock out (KO) and isogenic control (CTR) lines were used to establish in vitro 3D myelinoids as a human model of CD. It is a robust system that recapitulates the cellular complexity of the developing brain, consisting of progenitors, mature neurons, astrocytes and myelinating oligodendrocytes to study the loss of function of ASPA and accumulation of NAA over long periods of time. Systematic analyses, including cell type composition, morphology and comparison of single cell and bulk gene expression profiles across conditions were performed. Key transcriptomic findings will be further followed up with mechanistic experiments, including pharmacological and/or genetic manipulation of relevant pathways to further dissect their role in CD biology.

FT4. Myelin sheath formation in the zebrafish CNS

S. Radha 1, 2, G. Kislinger 2, M. Schifferer 2, 4, M. Djannatian 3, 4, M. Simons 1, 2.
1. TUM 2. DZNE 3. Klinikum TUM 4. SyNergy

During CNS development, oligodendroglia selectively wrap axons using the synergistic action of axo-glial membrane adhesion proteins to form the multilamellar myelin sheaths that enable saltatory conduction and provide metabolic support. Previous research identified axo-glial adhesion proteins such as contactin1b (cntn1b) and myelin-associated glycoprotein (mag) to be necessary for myelin sheath formation, where the combined loss caused hypomyelination and myelin abnormalities. Here, we aimed to identify the core ensemble of axo-glial adhesion proteins underlying the formation of myelin sheaths. We performed CRISPR-Cas9-based reverse genetics screen for candidate genes and confocal microscopy in the zebrafish model system. We found that the loss of a third adhesion protein, cell adhesion molecule (cadm4), in combination with cntn1b and mag leads to severe hypomyelination and aberrant focal accumulation of myelin in the spinal cord axons. In vivo time-lapse imaging revealed that the loss of the triple adhesion system resulted in fewer myelin sheaths forming initially, suggesting a defect in myelin targeting. We next aim to use SEM to investigate the myelin ultrastructure in the triple genetic knockout. In conclusion, our study highlights the triple axo-glial proteins - cntn1b, mag, and cadm4 as the core adhesion system underlying myelin sheath formation in the zebrafish CNS.

FT5. Early cingulate-striatal interactions underlie the development of ultrasonic vocalization

Guoming Tony Man, Mattia Chini, Ileana Hanganu-Opatz
Center for molecular biology Hamburg; UK Eppendorf

The prefrontal cortex (PFC) is a central hub for cognitive processing. Compared to other brain areas, the PFC is considered to have a protracted developmental timeline, which has led to the assumption that early interactions between the neonatal PFC and its downstream targets, such as the striatum (Str), play only a minor role in neonatal behavior. Contrary to this old belief, we show that neonatal PFC-Str are not only functional but also critical for neonatal behavior as this network is crucially involved in regulating a survival-relevant innate behavior, ultrasonic vocalizations (USVs). We show that neuronal and network activity in both the PFC and Str as well as the communication between the two areas sharply increases immediately before USVs onset. As mice develop, their USVs become longer, louder, and more complex. They build “sentences”, i.e. groups of covalizations occuring together. Supporting the hypothesis that the prefronto-striatal network controls neonatal vocal behavior, optogenetic stimulation of the PFC impacts the number and the characteristics of USVs in a manner that resembles how they mature throughout physiological development. Thus, despite its prolonged developmental timeline, the PFC plays a crucial role in controlling neonatal USVs, an innate behavior that is necessary for survival.

FT6. Human adherent cortical organoids derived from individuals with grey matter heterotopia

Rebecca Bonrath (*LMU*), Silvia Cappello (*LMU*), Femke de Vrij (*EMC*), Cristina Campi (*UNIGE*), Mark van der Kroeg (*EMC*)

Human organoids are a valuable human system to model neurodevelopmental disorders. However, reproducibility issues and longtime cultures are limiting this model system. Therefore, we have established adherent cortical organoids. These organoids are highly reproducible and reduce the cultivation time for electrophysiological readout to 8 weeks. They derive from Neural progenitors, plated in a 384 well plate. Thus, they give the opportunity for high throughput screening. Our final goal is to reproduce the migration and electrophysiological phenotypes observed in classic organoids and patients with grey matter heterotopia to provide a robust, reproducible model to study NDDs.

FT7. The (injured) brain on (neuro)steroids: diagnostic biomarker utility?

Kosisochukwu E. Umeasalugo, Igor Khalin, Burcu Seker, Philippe Liere, Michael Schumacher, Inga Koerte, Nikolaus Plesnila
LMU Hospital Munich, Institute for Stroke and Dementia Research (ISD)

Mild traumatic brain injury (mTBI) accounts for 80% of all TBI and is difficult to diagnose due to a lack of objective markers. In this study, we investigated whether neurosteroids, synthesized de novo in brain, can serve as blood biomarkers for mTBI. Two cohorts of C57BL/6 mice were subjected to a model of mTBI combining impact with rotational acceleration or sham surgery. The first cohort underwent neurological testing for anxiety, balance, and locomotion before and after mTBI. For the second cohort, brains and plasma were collected 6 or 24 hours after mTBI to measure steroid and neurosteroid levels by gas chromatography-tandem mass spectrometry. Traumatized mice did not suffer from skull fractures, intracranial hemorrhage, or mortality, but exhibited significantly prolonged wake-up time from anesthesia, transiently increased beam-walk time, and mild astrogliosis compared to their control counterparts. Isopregnanolone (ISOPREG) and isoallotetrahydrodeoxycorticosterone (ISODOC), both synthesized by a single enzyme, were significantly decreased by more than 50% in brain parenchyma at 6 and 24 hours after mTBI, while ISODOC was also significantly decreased in plasma (-75%). Therefore, ISODOC may be a candidate diagnostic biomarker for mTBI.

P1. How does thinking more positively change our mind?

Chunyan Shi, Jonathan Wirsich, Zile Chen, Patrik Vuilleumier
Department of Fundamental Neuroscience, University of Geneva

Reappraisal is an intentional attempt to change emotion through reconstrual or repurposing. In our study, we want to reveal the differences between positive reappraisal (reinterpret the cause, outcome and consequence in a more positive way) and negative attenuation (reinterpret in a less negative way). Seventeen university students with healthy mental states were recruited to perform an emotion regulation task, in which they need to watch or reappraise the emotion that are triggered by the pictures (40 neutral and 120 negative, from the Nencki Affective Picture System) according to the instructions. After each picture, they rated on positive emotion, negative emotion and arousal scales. At the same time, brain oscillations were measured using a 64-channel electroencephalography system and skin conductance level was measured with Biopack system. Results indicated that both positive reappraisal and negative attenuation reduced arousal, negative emotion and increased positive emotion. Negative attenuation is mor

P2. Axonal roles of 7SK RNPs in developing motoneurons

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P8. Spinal Motor Networks in Sound-Producing Piranhas

Lea Thüminger, Boris P. Chagnaud
Institute of Biology, University of Graz

Spinal motor networks in vertebrates exhibit remarkable adaptability, generating diverse locomotor patterns and behaviors beyond locomotion. One such adapted spinal circuit is found in red-bellied piranhas (Pygocentrus nattereri), which produce complex acoustic signals for social communication. These sounds are generated by contractions of a single pair of sonic muscles attached to the swim bladder. The contractions of the sonic muscles differ from those of locomotor muscles in both frequency and activation patterns. While sonic muscles contract simultaneously and repetitively at high frequencies (80 Hz), locomotor muscles contract alternately at lower frequencies (5 Hz). To achieve such specialized contraction rates, the sonic muscles require (in contrast to locomotor muscles) fast, repetitive, and precisely timed neuronal inputs. We explored anatomical and physiological adaptations underlying the differing frequency regimes and activation patterns between these two behaviors. We backfilled sonic and locomotor motor neurons through muscle injections. Sonic motoneurons were, on average, larger than the locomotor ones. Motoneurons were organized in spatially distinct, yet overlapping pools. Patch clamp recordings of motoneurons from spinal cord slices revealed two types of motoneurons with different firing precision. Whether these firing patterns can be attributed to sonic and/or locomotor motoneurons remains to be determined.

P9. Direct Neuronal Reprogramming of oligodendrocytes progenitor cells

Fabio Laredo, Oleksandra Pavlovska, Magdalena Götz, Giacomo Masserdotti
Institute of Stem Cell Research, Helmholtz Munich

Direct neuronal reprogramming is a promising avenue for cell-based therapies aiming at replacing lost neurons with newly generated ones via the direct conversion of resident, non-neuronal cells into functional neurons. OPCs are the only cell type that proliferate in the adult brain parenchyma, and therefore their direct conversion would not cause their irreversible depletion. To investigate if, and how, OPCs can be reprogrammed into neurons, we established a protocol to isolate and culture OPCs from the cortical gray matter of mice at postnatal age. Primary cultures of OPCs were transduced with retroviruses encoding for different transcription factors, such as Neurogenin2, Ascl1 and NeuroD1. Interestingly, at 7 days all factors besides Ascl1 generated neuronal cells, which matured over time into functional neurons, as assessed by electrophysiological analysis. We then investigated the molecular mechanisms underlying the direct reprogramming of OPCs via single RNA sequencing and CUT&RUN. To translate these findings into a human context, a protocol to differentiate induced pluripotent stem cells (iPSC) into OPCS, and the preliminary results on the direct conversion of hIPSC-derived OPCs into neurons. Together, these data provide compelling evidence that OPCs can be reprogrammed into neurons, paving the way for investigating their direct neuronal conversion in vivo.

P10. Effects of local protein synthesis on protein pool

Kanaan Mousaei, Cornelius Bergmann, Tatjana Tchumatchenko
Institute of Experimental Epileptology and Cognition Research

This study looks into the hypothesis that the amount of the protein pool in dendrites corresponds with the presence or lack of dendritic mRNA for local protein synthesis. Proteins that lack dendritic mRNA synthesis compensate for this constraint by keeping a larger pre-existing pool inside the dendrite, functioning as a "standby" pool, resulting in larger dendritic pool than the synaptic population. To investigate this hypothesis, we examined well-established protein and mRNA localization profiles reported experimentally in previous studies. In addition, we developed a mathematical model to represent the distribution of neuronal mRNA and proteins within the dendrites and synapses of a neuron. Our findings validated the hypothesis, indicating a negative relationship between dendritic mRNA and the amount of the pre-existing dendritic protein pool. Simply meaning, proteins without the capacity to synthesize locally had a greater "stand-by" pool within the dendrite than those with local mRNA. To further confirm these findings, we used existing synaptic and dendritic protein imaging data from prior work, as well as dendritic mRNA localization data. These findings provide a unique viewpoint that the interaction of local protein production and pre-existing dendritic pools is identified as a critical element in generating the dynamic proteome at synapses.

P11. Adaptation of eating behaviour by LH populations

Carolin Schumacher (ENI Göttingen), Tatiana Korotkova (Institute for Systems Physiology, Cologne), Anne Petzold (ENI Göttingen)

Motivated behaviour such as eating is regulated through hypothalamic circuits. Particularly, the lateral hypothalamus (LH) harbours distinct neural subpopulations that adapt behaviours to current need states. Brain-derived neurotrophic factor (BDNF) is an obesity risk gene. BDNF-expressing neurons in the LH (BDNFLH) may play a role in responding to energy states and modulation of eating behaviour. We investigated whether BDNFLH neurons modulate feeding behaviour. Using single-cell Ca2+ imaging in freely moving mice, we found that BDNFLH neurons are excited by food more than by other rewards. Chemogenetic activation of BDNFLH neurons acutely decreased the consumption of palatable, high-fat food, without affecting daily food intake, body weight or glucose tolerance compared to control group. To test whether BDNFLH neurons are involved in the experience-dependent adaptation of eating behaviour, we performed a context-conditioned overconsumption task. Hungry animals are allowed to feed in one particular context, leading to overconsumption of sated animals when presented again with the conditioned context previously associated with satiation. We found that chemogenetic activation BDNFLH neurons during consolidation of the conditioned context led to overconsumption across contexts. Our findings suggest an important role of BDNFLH neurons in the experience- and state-dependent adaptation of eating behaviour.

P12. The role of DNMT3A in neuronal function and its PO

Stefanos Loizou, Marlene Rosa Luckow, C. Peter Bengston, Harrison Gabel, Ana M.M Oliveira
Molecular Cellular Cognition Research, ZI, Mannheim

A de novo mutation in the DNA methyltransferase 3A gene (DNMT3A) causes Tatton-Brown-Rahman syndrome (TBRS), a recently described genetic neurodevelopmental disorder that currently has no treatment. Patients display tall stature and intellectual disability. Dnmt3a encodes for the enzymes Dnmt3a1 and Dnmt3a2. These enzymes, according to literature as well as work from our lab, play a crucial role in emotion and cognition regulation. However, the extend of behavioural, neuronal, molecular, functional, and structural changes in TBRS remains poorly understood. This project aims to bridge this gap of knowledge by using a novel TBRS mouse model. Our data thus far revealed prominent sex dependent behavioural differences in these mice in anxiety related tasks. Morphometric analysis revealed sex and genotype dependent differences at both p21 and p90, as well as a disruption of natural age related morphological changes in the CA1 hippocampus. These changes were, however, not observed in amygdala neurons. Additionally, alternations in functional connectivity between CA1 neurons were also established. Given that recent preclinical gene replacement approaches in adults have yielded positive results for other neurodevelopmental disorders in reversing some of the pathology, in a next step, Dnmt3a will be restored in adult TBRS animals to observe if deficits are ameliorated.

P13. Function and regulation of Dnmt3a1 in memory formation

Nekane Balcells-Picaza, Janina Kupke, Franziska Mudlaff, Ana M.M. Oliveira
ZI-Mannheim, Neurobiology department-UniHeidelberg

Learning, the acquisition of new information, and memory, the ability to retain information in the long term for later reconstruction, are central functions in the life of an individual. The neurons engaged in the learning and memory processes undergo persistent changes to encode the new information. The activity of transcription factors and epigenomic regulators play a central role in the integration of the new information through the regulation of gene expression and de novo protein synthesis. The newly synthesized products underlie stable changes in neuronal function. However, the mechanisms that regulate learning-induced gene expression required for memory formation are not fully characterized. In this study we investigate the contribution of DNA methylation and the function of a de novo DNA methyltransferase (Dnmt3a1) to activity-induced gene expression and memory formation.

P14. MouseFlow: behavioral tracking in head-fixed mice

Lam Bui (ENI), Janelle Pakan (LIN) , Simon Musall (IBI), Anne Petzold (ENI), Oliver Barnstedt (ENI)

In rodent studies, animals are typically head-fixed to allow for stable optical or electrophysiological recordings. High-resolution cameras are used to capture these behaviors, but analyzing the resulting data poses challenges. To address this, we introduce MouseFlow, an open-source Python toolbox to quantify subtle facial and body movements. By leveraging machine learning techniques alongside kinematic analysis and computer vision algorithms, MouseFlow simplifies the process of extracting fine-grained behavioral insights. MouseFlow employs a pretrained network to track pupil diameter, eye movements, and blinks, regardless of camera angle or lighting conditions. Additionally, this network allows for automatic segmentation of key facial regions: the whisker pad, nose, and mouth. To address limitations posed by single-marker, we use dense optical flow algorithms to quantify both the magnitude and direction of whisking and sniffing. This approach allows for high-fidelity measurement of these activity, providing detailed information on their frequency and phase. MouseFlow also tracks changes in mouse gait at different treadmill speeds, revealing distinct movement patterns that are related to neural activity across various brain regions. By providing a powerful tool for fine-scale behavior quantification, MouseFlow enables researchers to study detailed behaviors in head-fixed rodents and better understand the relationship between specific behaviors and neural activity.

P15. Modifying physiological TDP-43 oligomerization to reverse neurodegeneration

Sofiia Ushakova, Laura De Vos, Magdalini Polymenidou
Department of Quantitative Biomedicine, University of Zurich

TAR DNA-binding protein (TDP-43) aggregates in 97% of amyotrophic lateral sclerosis (ALS) cases, 45% of frontotemporal dementia (FTD) cases, in subsets of patients with Alzheimer's, Parkinson's, and Huntington's disease, and in limbic-predominant age-related TDP-43 encephalopathy (LATE). TDP-43 is a ubiquitously expressed RNA-binding protein essential for cellular function and survival. Physiological TDP-43 exists in cells in form of monomers or oligomers. Oligomeric TDP-43 is mostly localized in the nucleus, where it is involved in mRNA processing, stability, and transport. TDP-43 monomers flow out of the nucleus through passive diffusion and localize in the cytoplasm. Previous studies from the Polymenidou lab and others have shown that TDP-43 monomers lose their RNA metabolism function and become more prone to aggregation. We hypothesize that the transition of TDP-43 from its physiological to pathological states is driven by changes in the oligomerization dynamics of this protein. Therefore, my PhD thesis is focusing on determining the genetic modifiers of TDP-43 oligomerization and validating the occurrence of altered TDP-43 oligomerization in human iPSC-derived neural networks (iNets) and in patient tissues. Additionally, I will investigate the molecular mechanisms that stabilize TDP-43 oligomers, with the goal of identifying potential drug targets that promote dimer stabilization in TDP-43 proteinopathies.

P16. Striatal plasticity in stroke survivors using tTIS

Krishna Priya.Radhakrishnan, Dr. Maximilian. J. Wessel
Uniklinikum Wuerzburg

Motor skill acquisition involves the gradual learning and refinement of movements through repetitive practice, critical for tasks such as playing instruments or managing neurological conditions like stroke or Parkinson's disease. Research highlights the role of key brain regions, including the motor cortical areas, thalamus, striatum, and cerebellum, which form two distinct circuits: the cortico-striatal and cortico-cerebellar. These circuits support different phases of motor learning. The 'fast' phase, characterized by rapid improvements, engages visual-spatial representations through associative brain areas, while the 'slow' phase consolidates motor performance through sensorimotor regions. Non-invasive brain stimulation (NIBS) techniques, such as transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS), have been used to enhance motor learning. Recently, Transcranial Temporal Interference Stimulation (tTIS) has shown potential for targeting deep brain structures like the striatum, offering a promising tool for improving motor function. tTIS provides superior focality and precision, with early studies demonstrating its ability to influence neural activity and motor learning behavior.In this study, we will investigate striatal plasticity and motor skill learning in chronic stroke patients using tTIS. The striatum is selected as a model target due to its important role in acquisition and consolidation of motor skills

P17. DBS decreases PD pathology in the SN of PD mouse

Wei Chen, Rhonda McFleder, Chiwang Ip
Neurologische Klinik und Poliklinik, Universitätsklinikum Würzburg

The pathologic hallmark of Parkinson's disease (PD) is dopaminergic neurodegeneration in the substantia nigra (SN). This neurodegeneration is associated with aggregated pathological α-synuclein, which activates immune cells leading to the targeted destruction of dopaminergic neurons. Although there is no cure for PD, deep brain stimulation (DBS) was recently shown to be able to reduce neurodegeneration in the SN. However, if it does so by modulating alpha-Synuclein pathology, remains unclear. To test this hypothesis, we utilized a well-characterized PD mouse model where wild-type (WT) mice are stereotactically injected in the SN with an adeno-associated virus serotype 1/2 (AAV1/2) expressing human mutant a-synuclein (A53T). Two weeks post-injection, electrodes were implanted into the subthalamic nucleus (STN) for continuous DBS over 12-14 days. At six weeks post-injection, the brains were harvested and immune cells and pathologic α-synuclein were evaluated with immunohistochemistry (IHC) and immunofluorescence (IF). In the pars compacta (SNpc), IHC and IF analyses revealed that DBS decreases A53T-induced TH+ dopaminergic neurodegeneration. Furthermore, both T-cell infiltration and α-synuclein aggregation were significantly reduced after DBS. These findings suggest that DBS may exert neuroprotective effects in PD model mice through modulation of α-synuclein aggregation, providing insights into its potential as a disease-modifying therapy in PD.

P18. The role of lipid metabolism in the brain ependymal cell layer

Lennart Schlaphoff, Prof. Mikael Simons
German Center for Neurodegenerative Diseases (DZNE), Technical University Munich (TUM)

Cells can neutralize excess lipids by storage in lipid droplets. Lipid droplets are specialized dynamic organelles with a complex surface proteome and a neutral lipid core. While specialized lipid storing cells can be found in the periphery in form of adipocytes, cells of the brain are also capable of storing lipids. Most glia only store significant amounts of lipids under specific conditions, ependymal cells on the other hand constantly harbour lipid droplets at any given time after birth. Ependymal cells are specific epithelial cells which line the ventricle of the brain and are mostly recognized for generating CSF flow by their cilia beating and for contribution to the brain-CSF-barrier (BCB). Lipid droplet formation in ependymal cells has been observed in the past by several researchers. Nonetheless, the reason for these significant lipid droplet formations are still unknown. Here, we try to elucidate the reason for this storage, the molecular mechanism behind it, and the consequences of deregulation.

P19. Evolution of the olfactory system in Heliconiini

Yi Peng Toh (LMU), Francesco Cicconardi (University of Bristol), Richard Merrill (LMU), Stephen Montgomery (University of Bristol)

Sensory system evolution plays a crucial role in shaping species' interactions with their environment, yet the extent to which olfactory system diversity reflects ecological and evolutionary pressures at a macroevolutionary scale remains unclear. Here, we investigate the evolution of the olfactory system across the Heliconiini butterfly tribe, an ecologically diverse but closely related group. Using a comparative approach, we examined variation in antennal lobe morphology and as olfactory receptor repertoires across species. We found that antennal lobe size variation is driven by independent shifts in glomerular and antennal lobe hub volumes, with species-specific differences occurring against a backdrop of broader phylogenetic stability. While no direct associations with ecological traits were observed, certain species showed large expansion in glomerular volume and olfactory receptor numbers, warranting further investigation into unmeasured ecological or behavioural factors. Additionally, comparisons between wild-caught and insectary-reared individuals revealed a surprising pattern of developmental plasticity, with antennal lobe hub volumes increasing and glomeruli volumes decreasing in captivity, highlighting the influence of environmental conditions on neural development. These findings suggest that olfactory evolution in Heliconiini is shaped by both evolutionary divergence and developmental plasticity, emphasizing the need to integrate phylogenetic, ecological, and developmental perspectives to fully understand sensory system adaptation.

P20. Autophagy modulation to enhance stress resilience

Minnah Irfan1, Juan-Pablo Lopez2, Nils Gassen3, Mathias Schmidt1.
1-MPI of Psychiatry, 2-Karolinska Institute, 3-UKB

Several studies have highlighted the differential expression of core autophagy genes in neuropsychiatric disorders. My research aims to enhance autophagy signaling by using Nanobodies to specifically target ATG9a, the only transmembrane protein in the autophagy pathway, to stabilize it on the membrane. We hypothesize that stabilizing ATG9a will amplify autophagy signaling and promote a stress-resilient phenotype. For this, we conduct behavior phenotyping in semi-naturalistic settings, analyzing behavior over overnight recording sessions followed by employing supervised and unsupervised behavioral phenotyping pipelines to characterize the resilient phenotype. In this poster, I present baseline expression levels of ATG9a across key brain regions implicated in stress-related disorders, as well as its changes following chronic social defeat stress (CSDS). The poster also discusses shifts in autophagy flux post-CSDS.

P21. Identify effects of CD8+ T cells causing ND in PD

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Parkinson's disease (PD) is characterized by the progressive degeneration of dopaminergic neurons in the substantia nigra (SN), with neuroinflammatory mechanisms increasingly recognized as key contributors in disease pathogenesis. The goal of this study was to use a combination of cell culture models and spatial transcriptomics to identify the immune cell types infiltrating the brain in PD and their role in neurodegeneration. The SN of wildtype mice was stereotactically injected with an Adeno-associated virus serotype 1/2 (AAV1/2), that was either empty (control model) or expressing the human mutant form of α-Synuclein (PD model). From these mice, brains were harvested for spatial transcriptomics, while splenic CD8+ T cells were isolated and co-cultured with MN9D neuronal cells. Co-cultures revealed a PD-specific neurodegeneration mediated by CD8+ T cells from PD mice. Cytokine analysis further demonstrated a PD-specific pro-inflammatory profile, indicating neuroinflammatory pattern in PD conditions. Spatial transcriptomics revealed elevated astrocyte containing spots in PD brains, supporting the role of immune-mediated neuroinflammation in PD progression. These findings highlight the contribution of α-synuclein-specific CD8+ T cells in neurodegeneration and suggest that targeting this immune population may serve as novel therapeutic strategy in PD.

P23. Influence of ApoE isoform on tau seeding

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Tau is a microtubule-associated protein that forms insoluble filaments, accumulating as neurofibrillary tangles in Alzheimer's disease (AD) and other tauopathies. APOE4 is the strongest genetic risk factor for late-onset AD, yet its role in modulating tau pathology remains poorly understood. We found that aggregated ApoE4 accelerates tau aggregation, while monomeric ApoE does not exert this effect. To assess whether monomeric ApoE influences tau seeding and spreading in vivo, we used non-transgenic mice expressing human ApoE knock-in variants and inoculated them with tau preformed fibrils (PFFs) derived from AD patient brains. Our data show no difference in tau seeding efficiency between ApoE3 and ApoE4 knock-in mice, suggesting that the aggregation state of ApoE is critical for its impact on tau pathology.

THANK YOU…

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And most importantly thank you, dear participant, for coming!!

We are looking forward to next year's edition and until then, we wish you a wonderful experience in Munich during the **34th NeuroDoWo!**